IOT BASED ACCIDENT PREVENTION AND INTIMATION SYSTEM

Mrs. Shabana Parveen
Asst. Prof. Dept. of ECE
Sri Sai Ram Engineering College
West Tambaram, Chennai-44
shabana.ece@sairam.edu.in

Bharath kumar KK
Dept of ECE
Sri Sai Ram Engineering College
West Tambaram, Chennai-44
e8ec194@sairamtap.edu.in

Deepak S
Dept. of ECE
Sri Sai Ram Engineering College
West Tambaram, Chennai-44
e8ec108@sairamtap.edu.in

Gokul N
Dept. of ECE
Sri Sai Ram Engineering College
West Tambaram, Chennai-44
e8ec090@sairamtap.edu.in

***Abstract*—Road traffic accidents (RTAs) have emerged as an important public health issue that needs to be tackled by a multidisciplinary approach. In countries like India, the tendency for RTA injuries and deaths is alarming. The number of fatal and disabling road accidents happening is increasing day by day and is a real public health challenge for all the concerned agencies to prevent. The approach includes the proper implementation of the alert system for the accident and to prevent some death cases which happen due to delay in taking hospitals. Exclusively we are including prevention of accidents using an alarm to intimate the driver to be precautious to maintain the distance between vehicles. Our Project mainly considers these scenarios where no man situation appears and tries to reduce the death rate by a proper information system and prevention. This project implemented an IoT system that triggered the incident and attempted to contact the person responsible to take immediate and necessary action. This project has an implementation of an auto accident detection system through IoT using piezoelectric sensors and a Raspberry PI. With the help of piezoelectric sensors, we can detect whether an accident happened and further proceed with the intimation system. The Intimation system works on the Raspberry PI's Wi-Fi module through the firebase database. With the help of a webpage, we can notify the required personnel and hospital. In prevention we implement a ML algorithm which detects the blink rate of the driver and if the driver feels sleepy or in sleep the system intimates the driver by ringing a buzzer.**

***Keywords*—RTA, IoT, Wi-Fi, Raspberry PI, ML, HAAR, EAR, UCL, GPS, GSM, MediaPipe.**

I. INTRODUCTION

Due to the rapid increase in world population, the demand for the use of means of transport is increasing sharply, leading to problems of traffic congestion and road accidents. The general population's life is under high risk, if any accident occurs there's a long reaction time which increases the number of deaths, therefore an automatic accident detection system must be implemented in a vehicle to overcome this situation. Statistics show that road traffic accidents are the leading cause of injury-related death. There can be multiple causes of road accidents, some of them are, driver negligence due to drowsiness, driving while intoxicated, over speeding etc. [2] Some studies shows the convolutional approach of Machine Learning algorithm to detect the drowsiness by calculating the EAR (Eye Aspect Ratio). This paper discusses the more less computational approach of using image processing based on MediaPipe frame work to calculate the EAR to detect the drowsiness. A collision between any on-road cars, barriers, or pedestrians is referred to as a road crash. The time the ambulance takes to arrive at the scene of the accident and transport the injured person to the hospital has a significant influence on the victim's survival rate. In the majority of traffic accidents, the injuries are minor and the victim's life can be saved; but, because rescue crews arrive late, the injuries become fatal. So, the main goal is to determine where the accident happened, sending information to the rescue teams in a much shorter time so that they can take the necessary measures, saving the victim's life.

II. LITERATURE REVIEW

[1] In this paper, solutions have been proposed in the literature for automatic accident detection. Crash prediction employing cellphones, vehicle ad-hoc networks, GPS/GSM-based systems, and other machine learning approaches are among the techniques. Vehicle safety is the most important area to be thoroughly investigated due to the high mortality rate associated with road accidents. In this paper, a critical analysis of various existing methodologies used for predicting and preventing road accidents, highlighting their strengths, limitations, and challenges that need to be addressed to ensure road safety and save valuable lives.

[2] Mr. R.A. Bhope proposes a HAAR based EAR thresholding employing facial landmarks detectors in this research, which detects whether or not the vehicle driver is tired and prevents accidents caused by human errors. It uses a Viola-Jones based classifier to detect eyes and calculates the EAR for each frame, which if below a threshold indicates a closed eye state. According to UCL, the normal blink time for an eye is about 100,150 milliseconds. The proposed algorithm can distinguish between blinking and sleeping by recording a video stream, determining the EAR for each frame, and comparing this EAR with 20 consecutive frames captured per second. Because the algorithm requires no training, it is quick and simple to run on single-board computers like the Raspberry Pi. The

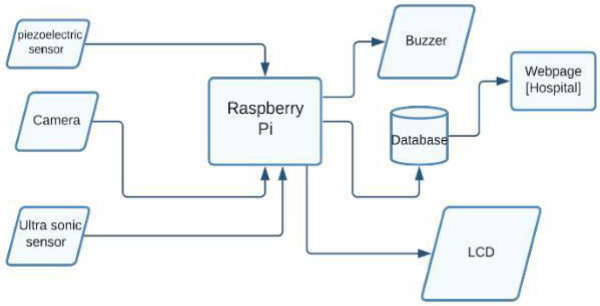
warning system comprises of a buzzer installed inside the vehicle and a Web Push Notifications system based on Web Sockets. When a drowsy state is recognized, the buzzer is attached to the Raspberry Pi's GPIO Pin, and the same Raspberry Pi also works as the Web Socket Server, sending Web Push notifications to registered cellphones. Web Socket Clients are cellphones with an internet connection that have been subscribed to the Web Socket Server to receive notifications. A Google Maps query for coffee shops is generated when the notification is opened, allowing the motorist to obtain a cup of coffee while staying awake on the road. Web Push Notifications can be subscribed to on up to 5 devices, allowing not only the driver but also the driver's well-wishers to be notified. Web Push Notifications are platform agnostic, meaning they can be delivered to any internet-connected device.

The two most common causes are driver mistake and delays in emergency department response time. An effective road accident identification and information sharing system is required to rescue injured persons. It's vital to have a gadget that sends information about the collision location to local emergency services so they can respond immediately. In the study literature, many scientists have proposed a variety of automatic accident warning systems. Smartphone-based accident detection, GSM and GPS technology, vehicle ad hoc networks, machine learning methods, and mobile apps are all examples. Every vehicle should be equipped with an automatic road accident detection and communication system. This study explores various evolving approaches to predicting and preventing road accidents and focuses on their strengths, weaknesses, and issues that need to be addressed to ensure traffic safety and save lives. The Internet of Things will help to ensure safe and efficient transportation. This is the case because IoT systems are controlled by event-driven programs that accept inputs in the form of sensed data, user feedback, or other external stimuli. This information is captured by several built-in sensors (a sensor is a sophisticated device frequently used to detect and respond to electrical and other signals). The acquired user data is converted into observable physical properties. Sensors such as a smoke alarm, motion sensor, touch sensor, and others are employed. [3] emphasized that people who are visually impaired have a hard time navigating their surroundings, recognizing objects, and avoiding hazards on their own since they do not know what is going on in their immediate surroundings..

III. TECHNOLOGY SURVEY

This project comprises of three major segments. Prevention, Detection and Intimation. The Prevention phase comprises of ultrasonic sensor, buzzer, LCD and Raspberry Pi Camera. The Detection phase comprises of GPS and Piezo electric sensor. The Intimation phase is a cloud based system which uses IoT gateway offered by Raspberry pi and the Firebase database as a cloud database. The Firebase database syncs real time to the webpage of the hospital which notifies the accident to the nearby hospitals using haversine formula.

Block Diagram:



Prevention:

Road accidents can be prevented to some extents by maintaining sufficient space between vehicles, this can be done by using ultrasonic sensors. The principle of this sensor is to measure the distance between two objects by sending sonic waves. The ultrasonic wave is used to calculate the distance using the analog value given by the sensor. By choosing an appropriate threshold value, we can maintain a legal distance between vehicles. Accidents also happen in cases where driver fall asleep. This can be prevented by giving a notification to the driver when he sleeps using Machine learning algorithms.

Detection:

Accidents cannot be prevented in all cases so it is necessary to detect accidents and intimate to the hospital. In this project, accidents are detected by using piezoelectric sensors. The piezoelectric sensor works on the principle of measuring pressure. Generally during accidents when the vehicle gets hit by another vehicle or object a great pressure is generated on the body of the vehicle if the accident happens on a massive scale. This pressure change in the vehicle can be detected by piezoelectric sensors to detect accidents.

Intimation:

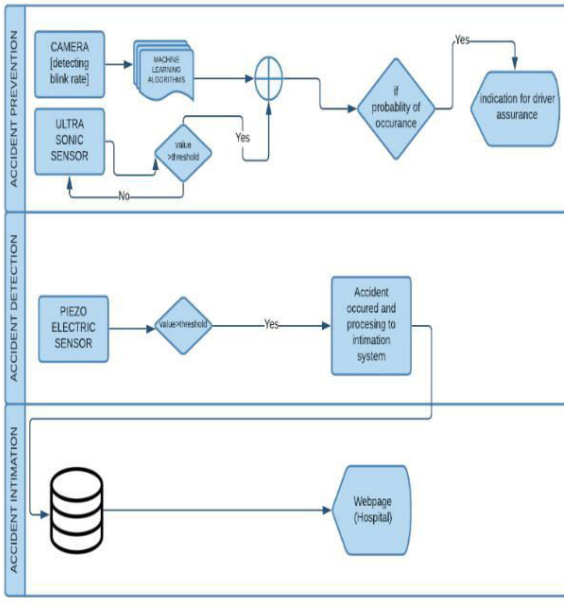
Delayed information about accidents to the hospital causes death. This can be avoided by automating the intimacy process. Once the accident happens the information about the person with location is sent to the hospital with the help of the Wi-Fi in the raspberry pi. This is updated in the firebase database later it sends a popup in the hospital website when the state of the firebase database changes on accident. This alerts the hospital and also it sends messages to ambulance drivers this reduces the delayed information or no information in some cases.

IV. WORKFLOW

This project continuously monitors the blink rate of the driver and the distance between the driver's vehicle and other vehicles. When the distance between points decreases,i.e. when the distance value is less than the threshold value set in the ultrasonic sensor, the siren immediately warns the driver and the LCD displays the message "Happy please maintain a distance from your vehicle", to warn drivers to maintain a distance between vehicle. The Blink detection done by image processing using Mediapipe a framework offered by Google. Mediapipe has different features like holistic, poses, hands and faces. This article uses the MediaPipe Face Mesh feature that detects the entire period as a standard 3D histogram with 468 points. By taking the certain point which maps to eye regions we can get the dimension of eye. This is done by relying on the fact that the horizontal diameter of the human iris is almost constant at 11.7 ± 0.5 mm in a large population, as well as some simple geometrical arguments. Using this we can calculate the EAR by dividing the height and width of the eye. This remains globally same irrespective of the individuals. The normal EAR ratio is around 4. If it is less than the preset value it is detected as a blink. Blink rate is the most important aspect for detecting the sleep..

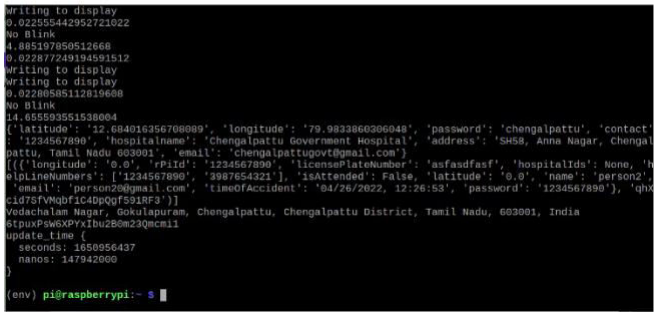
Flow diagram:

The flow diagram of the proposed system is given below



using piezoelectric sensors. Intent is accomplished using firebase database and updates are queried using the website and app for respective users such as hospitals, healthcare workers and required staff. bridge.

V. RESULTS



VI. CONCLUSION AND FUTURE WORKS

The number of people killed or injured in auto accidents is steadily increasing. If the victim is found in time, many lives can be saved. We looked at a variety of solutions for both identifying and preventing mishaps. Various sensors, such as GPS, Ultrasonic sensor, Piezoelectric sensor, and machine learning approaches, such as MediaPipe based neural network models, were used in these tactics. Methodologies for preventing accidents are also presented, such as ultrasonic sensor distance measurement and blink rate detection. When an accident is discovered, the information is quickly relayed with a local hospital using the Haversine formula. This project can further be extended by using lane detection and safe place location algorithm when driver cannot able to control the vehicle.

VII. REFERENCES

[1] U. Alvi, M. A. K. Khattak, B. Shabir, A. W. Malik and S. R. Muhammad, "A Comprehensive Study on IoT Based Accident Detection Systems for Smart Vehicles," in *IEEE Access*, vol. 8, pp. 122480-122497, 2020, doi: 10.1109/ACCESS.2020.3006887.

[2] R. A. Bhope, "Computer Vision based drowsiness detection for motorized vehicles with Web Push Notifications," *2019 4th International Conference on Internet of Things: Smart Innovation and Usages (IoT-SIU)*, 2019, pp. 1-4, doi: 10.1109/IoT-SIU.2019.8777652.

[3] Christo Ananth, Stalin Jacob, Jenifer Darling Rosita, MS Muthuraman, T Ananth Kumar, "Low Cost Visual Support System for Challenged People", 2022 International Conference on Smart Technologies and Systems for Next Generation Computing (ICSTSN), 978-1-6654-2111-9/22, IEEE, 10.1109/ICSTSN53084.2022.9761312, March 2022,pp. 1-4.